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NEW YORK SUGAR MARKET, Feb. 28.—Willett & Gray report.—Raws declined 1-32c. for Centrifugals. Refined unchanged. Net cash quotations are: Muscovados, 3.72c.; Centrifugals, 4.19c.; Granulated, 5.24c. Receipts, 42,896 tons. Meltings, 28,000 tons. Total stock in Four Ports, 146,352 tons, against 138,143 tons last week, and 149,708 tons last year.

The Collector of Customs at New York has now received the official ruling that the tariff will apply to Russian sugar afloat. This is considered unfair by importers who fully expected that they would be protected on sugars which might be on shipboard, at such time as the countervailing duty should be reimposed. Press dispatches show that Russia has already retaliated by imposing increased duties on American cast iron and steel machinery and tools, as was threatened.

Secretary Gage is reported as saying, on 18th inst.: "It is not a question of what the manufacturers desire or think ought to be. It is not a question of what the sugar refiners or our beet sugar raisers desire or think ought to be. It is a question purely of law and of fact. The Secretary of the Treasury is sworn to enforce the law—not to make laws."

Following is the order addressed to O. L. Spaulding, Assistant Secretary in charge of customs:

"You will instruct collectors and other officers of the customs that in pursuance of the provisions of Section 5 of the act of July 24, 1897, the amount of the bounty or grant paid or bestowed by Russia on the export of sugar is hereby declared to be 64 kopecks per pood of refined sugar, and that an additional duty equivalent to such amount must be assessed and collected under said Section 5 of the act of July 24, 1897."

We have received several pamphlets and sheets relative to the Buffalo Pan-American Exposition, which opens in May and continues for six months, till November 1. The statement is made that Buffalo ranks as the fourth shipping city in the world—a fact which few people are aware of. There will no doubt be a very large concourse of visitors from all parts of the world, especially if the rates of steamship and rail fare are reduced to a point that will attract those living at long distances. The fare might be reduced to one-half with advantage to the transportation lines of steamers and railroads. Such a reduction is often made to attract visitors from Europe and America, and it would doubtless increase the number of visitors very largely to this latest and grandest exposition, where all the latest novelties and inventions will doubtless be gathered for exhibition. Many people living in these islands would no doubt arrange to visit this Pan-American Exposition were the fare so reduced for the five thousand miles of ocean and land travel.

Riverside, California.—The orchard area of Riverside is thirty square miles, or 19,200 acres, in which are growing 1,536,000 Orange trees, so that until some other district can adduce figures in excess of these, the claim of Riverside to be the greatest orange-growing locality in the world must remain undisputed. These trees are planted twenty feet apart, and the produce is estimated at about 318,024,000 oranges, and the product of this district is stated to be one-third of the output of the State. The money value of this enormous quantity is calculated at 6,000,000 dollars, or an average of over 671 dollars for every man, woman and child in the district. Although oranges are shipped from Riverside every month in the year, the bulk of the crop is gathered and exported between December 1 and May 1. Riverside is especially favorable for the cultivation of the orange, for it has all the essential elements of success; an ample water supply, the proper soil, the right altitude, and the absence of fogs. The selling value of orange groves in bearing varies from 500 to 2000 dollars per acre. The most favored variety in the Riverside district, where indeed it may be said to have been first cultivated, is the Washington Navel, the king of oranges; it has stood the test of twenty-five years cultivation, and maintains its superiority. This fruit originally came from Brazil.

Irrigation.—The water problem, like the forest problem, is essentially and primarily one of conservation and use. The waste of water in floods and the waste of forest by fire are parallel losses, each utterly hostile to the best interests both of the farmer and of the nation at large, and each preventable by perfectly well-known means. Enlightened public opinion and the use of expert skill are the two forces which are indispensable if we are to "save the forests and store the floods," in accordance with the admirable motto of Congress. The creation of public sentiment will be immensely forwarded by your meetings, and you may safely look to the National Government for some part at least of the trained skill to study the water problems which confront the irrigator, and to make the forests of the Great West, and the East as well, yield their products year after year and decade after decade in unbroken abundance. The vast developments which are planning can become permanent only by the junction of wise conservatism with energy; and the natural resources which have cost nothing must be protected and husbanded with the same trained care which you are making ready to bestow upon vast systems of artificial works for irrigation. The chief dangers which threaten your plans—one the failure to secure the building of these great works, the other the failure to protect the forests from which your waters come—are best met, like most of the dangers which threaten our country, by the broad diffusion of wise principles.—Secretary Wilson.

A new question has lately arisen regarding Russian beet sugar imported into the United States. The beet sugar industry in Russia receives assistance from the government, which controls the entire output by regulations specially enacted for this purpose. This assistance operates as a bounty and the government controls the entire crop, and its sale. The amount annually imported into the United States is not large, that for 1900 having been valued at about $300,000, but being of fine quality it finds a ready sale when imported. It is said that the Russian government will retaliate and impose duties on American manufactures which heretofore have been admitted under low duties or perhaps free. The question has been referred to the board of general appraisers for investigation and report. Willett & Gray's Statistical says that "The action of Secretary Gage endorses the vote of the conference held last year at Brussels to the effect that Russia should be placed upon the same basis with other countries in the payment of countervailing duties on sugar. Now that the duty has been imposed upon Russian sugar, there will be no more exports of the product to this country, because the new extra duty of 91 cents a hundred pounds will practically exclude Russia from the American market. This will mean a cessation of only $300,000 worth of business a year. On the other hand, Russia may retaliate by imposing duties on American iron and steel—a commerce that runs up into the millions.

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DR. STUBBS' ADDRESS.

Recent mails have brought copies of Dr. Stubbs' address to the Louisiana planters, giving a sketch of his observations during his short stay here. His address is quite interesting and lengthy, and would, if inserted in full, cover the forty-eight pages of this monthly. We give a few paragraphs now, and may make further extracts later.

"These isolation of the Hawaiian Islands has given them a peculiar flora, containing a large proportion of plants found nowhere else. The peculiar characteristics of the islands contribute largely to such results and aid in multiplying varieties. The traveller may in a single day pass from the tropical heat of the coast to the region of perpetual snow, and if he crosses from the windward over to the leeward side of an island he will encounter a climate with a varying rainfall, from 100 inches annually to less than 30 inches. There is a wonderful diversity in temperature, rainfall, elevation and barometric pressure. The soil, however, is quite uniform, derived from a basaltic lava, with a narrow band encircling the islands on the coast of coral limestone. These soils are extremely porous, and the rainfall passes quickly into them, sinking into the artesian reservoirs, made possible by the encircling belt of coral, which furnish the portable and irrigating waters of the islands. Therefore, geologically speaking, the islands are very young, with a very limited fauna and flora.

The climate is more semi-tropical than tropical, and to a visitor is quite enjoyable, though permanent dwellers complain of the lassitude which the monotonous climate produces, after a sojourn of a few days on the islands.

Hawaii is fanned by northeast trade winds and laved by cool oceanic currents coming from the North, thus reducing by many degrees the temperature which its geographical position would predicate. The constancy of these winds and currents gives an equable temperature, averaging about 75 degrees F., throughout the year, with extremes of 60 to 85 degrees. Altitude is here the most potent factor of temperature, the thermometer falling about 4 degrees for every 1,000 feet of ascent; so that on the summits of Mauna Kea and Mauna Loa snow and ice may frequently be found.

The windward and leeward sides of the islands vary also in temperature and rainfall. The eastern or windward sides of the islands are constantly swept by strong winds, which produce heavy rainfalls and lower temperatures. While the western or leeward sides are comparatively calm, dry and warm. On the former, farming of all kinds can be carried on without irrigation, while on the latter, especially near the coast, irrigation is essential for the production of maximum crops. * * *

Only a small portion of the islands is capable of sustaining a dense population. The most fertile belts are near the ocean. The interior is mountainous and craggy with a very thin soil, adaptable in many instances to pasturage, but unfit for cultivated crops. Many parts of the shore belt are barren without irrigation, but extremely productive with an abundance of water. Other parts are covered with lavas not yet converted into soil, and still others that are gulched and carried into ravines so deep and precipitous that access is almost impossible. Deep rich soils at low altitudes form, probably, not over one-fortieth of the islands. Thinner soils, perhaps capable of producing profitable crops of some kind, are far more abundant.

The flora of the islands are divided into three classes. First, indigeneous plants, those found by the Hawaiians when they first settled the islands, reckoned by Judge Fornander to have been about A. D. 500. Second, those introduced by the Hawaiians and brought from other islands by Capt. Cook in 1778. It has already been shown that the affinities of the native flora were Polynesian, Andean and California. The complete isolation of the islands has given a peculiar flora containing a larger proportion of endemic plants than any other known country. The islands not only vary among themselves as to the character of flora found, but each individual island varies in its flora just in proportion to altitude. Again, the size and characteristics vary just in accordance with their environment. Heat and dryness of the air, a scanty soil, especially undecomposed lava, check life and dwarf the plants, and sometimes impose new properties. A period of short growth follows an occasional rainfall, and then a long repose with great effort to sustain life. These varying conditions acting through a series of years, have the power of modifying pre-existing qualities and impressing new ones, often producing variations from the normal type. Varieties change ultimately to species, and species to genera. Hence the large number of endemic plants on the islands. The native trees served to make the enormous canoes in which the natives crossed from island to island and occasionally made voyages to other islands in the South Pacific. Others were used for outriggers and masts. Idols were carved from the softer as well as the hard wood. The hardest varieties furnished mallets for beating "Kapa" cloth. The forest furnished the bark, leaves and fibre out of which "Kapa" cloth, mats, fishing lines, nets, etc., were made. They also furnished the dyes for the cloth and for tattooing their skins. The Materia Medica of the Kahunas (native doctors) was gathered exclusively from the fields and forests. * * * *

If time permitted I might speak of the beautiful groves of cocoanut trees lining everywhere the shores of the islands, and how visitors to Honolulu are taught to enjoy the several drinking stands. I might mention also the extensive banana plantations and pineapple groves which furnish a goodly amount of the exports of the islands, but must hasten on to the chief crops, which are rice, coffee and sugar. I might also enlarge upon the numerous taro patches and the universal use of "poi" as food, and of the many fine groves of bananas skirting the forests of cocoanut trees, hard by the ocean's brink, of the gardens of pineapples everywhere to be found, the orchards of alligator pears, mangoes, papayas, etc., but time forbids. The main crops of the islands, however, deserve more than a passing notice. Corn is grown in very small quantities; oats and barley not at all. Wheat, once an article of export, is now scarcely known on the islands.

Rice is now the second crop on the islands in quantity and value. The cultivation began in 1856, and every acre of land adjoining the ocean, capable of being worked and susceptible of being watered, is under cultivation. The Chinese are exclusively engaged in this industry, paying for rent $30 to $50 per acre. Two crops per year are grown on the same land. After the field is once prepared and watered it is never permitted to be unoccupied. As fast as one crop is harvested, another is planted. The soil is prepared by using a kind of a harrow, propelled by a Chinese buffalo, an importation from China and the companion of the Chinaman. This harrow is drawn through the water. It pulverizes the clods and stirs the soil, and resembles the tools for the cultivation of oyster grounds, on the shores of Connecticut. The rice is sown thickly in beds, and when sufficiently large are transplanted by hand in the field, in checks six to twelve inches apart, the water being several inches deep. Long lines are frequently used to keep the rows straight. It is a slow and tedious process, and only the persistent industry of a Chinese would essay such a task. If the persistent Chinaman can by such laborious methods wring a profit out of rice culture, it is almost certain that with improved implements for sowing and harvesting, and up-to-date mills to prepare the grain for market, there would be enormous gains in extensive cultivation of this cereal on the islands. The yield of clean rice per acre is from 1,000 to 1,500 pounds, which means a yield per year of twice this amount. The total yield of the islands is not far from 10,000,000 pounds. Rice constitutes the chief food of the larger portion of the population of the islands, and hence the home consumption is large. Besides this there are exported annually between six and eight million pounds.

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CUBAN SUGAR DUTIES.

The producers of sugar in Cuba have sent a petition to the President of the United States, urging a reduction in the duties assessed on Cuban sugars imported into the United States. The Secretary of War, with the President's approval, can increase or reduce duties on merchandise coming into the Island of Cuba at present, but no change can be made in the duties on goods imported into the United States from Cuba or elsewhere, except with the consent of Congress. Nothing is likely to be done for Cuba until the new constitution is prepared by the Convention, now in session at Havana, when it must be sent to the Government in Washington for approval. The Convention may complete its work by February 28th, but no action thereon can be expected at this session of Congress. There will be an extra session of Congress for the consideration of matters pertaining to Cuba and the Philippines, particularly as a decision by the Supreme Court will be rendered before long, on the Philippine and Porto Rico questions. It is therefore possible that action affecting Cuba will be taken before the next regular session of Congress in December. In his annual message of 1899, the President recommended that Cuban products be admitted on as favorable terms as those of the West Indies. Reciprocity treaties with West Indies are still pending in the United States Senate, providing for a reduction of 12½ per cent in the duties on sugar from those countries. The Secretary of the Treasury is in favor of a general revision of the tariff and a reduction in the duties on some articles, but Congress is not likely to favor such action. Sugar producers in Porto Rico are hoping for a decision from the United States Supreme Court, which will result in free trade with the United States immediately, without waiting until March 1st, 1902, when their goods will be admitted free of any duty under the law of April 12th, 1900.

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INDIA RUBBER CULTURE.

Attention has before been called to the cultivation of the rubber tree as a profitable branch of industry, which can be engaged in here as a safe investment. In another part of this number of the Planter will be found an article giving a description of the rubber forests of Brazil. The price of rubber is steadily advancing from year to year, and as no substitute for it has been found, the price must continue to advance. The tree grows here in the city very rapidly, but a more moist and rainy locality will probably produce more of the milky sap, which flows from the tree, when it is tapped, as the juice of the sugar maple is obtained and then boiled down to sugar. Probably the rubber tree will produce more sap if grown in rainy or moist localities, such at Kona and Olaa, on Hawaii. For a person with ample means to purchase the land, plant and care for a grove of two or three thousand trees, the india rubber production ought to prove a profitable investment, at the prices now ruling for the crude article, and the price will unquestionably advance much beyond what it now is, with no risk of its receding.

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MODERN ARTIFICIAL FERTILIZERS.

THEIR ORIGIN, MANUFACTURE AND USE.

The following treatise is intended mainly for the guidance of farmers in the selection of the proper fertilizers for our particular soils. Besides it is the purpose of these notes to explain the general principles upon which modern, rational manuring is founded.

THE CHEMICAL COMPOSITION OF PLANTS.—In order to ascertain which elements a plant requires for its normal growth and development it is necessary to find out of what it is composed. If the ashes of wood, straw, roots and other parts of plants is subjected to a chemical examination it is found that the same consists, invariably, of the following, viz: Phosphoric Acid, Potash, Lime, Magnesia, Sulphuric Acid, Chlorin, Oxyd or Iron, Silicic Acid and Soda. Water, Carbonic Acid and Ammonia (Nitrogen) have escaped as volatile gases during the process of combustion. All plants are therefore built up of these twelve substances combined together in different proportions.

The question now arises: Are all of these substances absolutely necessary for the normal growth and development of a plant or not? This matter has been the subject of careful and extensive experiments by eminent scientists. These experiments have demonstrated that a plant cannot thrive without sufficient quantities of water, carbonic acid, nitrogen, phosphoric acid, potash, lime, magnesia, oxyd of iron, sulphuric acid and chlorin; whereas silicic acid, and soda seem to be unessential. The former ten therefore constitute the real plant-food for without one of them no real plant-life is possible. Of course some of these are more important than others, besides some plants require more of one than of another; and it must be considered that soils differ a great deal in their chemical compositions, they are often rich in one plant-food and poor in the other. A soil, however, must contain all of these in order to be productive, with perhaps the exception of water and carbonic acid, which are supplied by the atmosphere, as is also a part of the nitrogen. It remains now to be determined which of the above substances are the most necessary and essential ones and which of them are generally deficient in our soils.

There is scarcely any soil on the Hawaiian Islands which lacks in oxyd of iron, (for the oxides of iron and alumina form the greater part of the bulk of our soils. Magnesia, sulphuric acid and lime are also mostly present in sufficient quantities. Although the percentage of lime is sometimes quite low, it is nearly always sufficient for the purpose of plant-food.

NITROGEN, PHOSPHORIC ACID AND POTASH must therefore be called the most important substances for it is these that we have to supplement by means of manure. A chemical analysis may often reveal quite a good supply of one or all of these in a soil, yet they are mostly present in a more or less insoluble and inert form and therefore of little or no avail to the plants. The plant-food of a soil is absorbed in a dissolved form by a peculiar action of the fine roots; it must be soluble before it is accessible to these roots, and although a small part of it is gradually rendered so through the influence of the sun, rain, and atmosphere, as well as the action of the roots themselves (by means of an organic acid secreted by them), this is in most cases not sufficient to produce good crops year after year.

Upon these facts are based the modern views on rational manuring and subsequent manufacture of suitable artificial fertilizers.

ARTIFICIAL FERTILIZERS AND THEIR MANUFACTURE.—The manufacture of artificial fertilizer is a distinct branch of the chemical industry and a flourishing one, for artificial manures are today just as indispensable on the modern farm or plantation as a plow. For an intense and rational management they are an absolute necessity, in fact oft-times the life of a farm depends upon it.

The material used for the manufacture of artificial fertilizers must be divided into three classes, viz: such that supply the phosphoric acid or the nitrogen or the potash.

The main sources of phosphoric acid are rock phosphates, guanoes and bones.

ROCK PHOSPHATES are mineral phosphates of sedimentary origin and are found principally in Florida, South Carolina, Canada, Spain, Algeria and many other places, in crystalline form (Apatite) or non-crystalline form (Phosphorite). They contain up to 80 and 85 per cent of pure tribastic phosphate of lime and are therefore very concentrated. They are scarcely ever used in their raw state, as a manure, as they are of little use even if finely ground. But manufactured into superphosphate they form the bulk of the phosphate manures on the market. Guanoes are found on many islands of the Atlantic and Pacific. They consist mostly of carcasses and dung of sea birds with more or less impurities. Some of them contain also considerable ammonia. Guanoes are also used extensively in the manufacture of superphosphates, in fact they are superior to miner phosphates, owing to the absence of fluorine and other undesirable ingredients, often found in the mineral phosphates.

Bones in the raw state are of little or no value as a fertilizer; they contain more or less fat, which retards their early fermentation. Various means have been brought into use to render the bones more available for manuring purposes. Boiled or steamed bones, when ground, form an excellent manure for some purposes, also bone-ashes and bone-black (charred bones). Bones are also used in the manufacture of superphosphates and double superphosphates.

In all of these substances the prevailing form of phosphoric acid is tricalcium phosphate and as this form is totally insoluble and of little use to the plants, it has to be converted into mohocalcium-phosphate, a water soluble form, before it can be used for manuring purposes.

When phosphates, guanoes or bones, (containing tribasic phosphate of lime,) are treated with the proper amount of sulphuric acid, to displace two of the bases, the result is a mass consisting of manocalcium phosphate and gypsum. This mass readily solidifies and is afterwards ground and sold as superphosphate. Another form of phosphoric acid is the dicalcium phosphate, in this only one base is displaced by sulphuric acid. Dicalcium phosphate is often known as available or citratesoluble phosphoric acid. It is not soluble in water, hence not as valuable as the monocalcium phosphate.

Double superphosphate is a very concentrated superphosphate, in which liquid phosphoric acid has been used for dissolving, instead of sulphuric acid.

There is another phosphate preparation known as the phosphate slag or Thomas Phosphate powders—a by-product of the Bessemer process of refining iron ores. It is used to a great extent in Europe owing to its cheapness. The phosphoric acid is mostly present in the form of tetracalcium phosphate. As it is low in percentage of phosphoric acid it must not be regarded for export. This article must be finely ground to be of any avail, as it is applied directly to the land without first undergoing the process of dissolving by sulphuric acid.

Of all the phosphate fertilizers there is none better suited to the local soils and conditions than the superphosphate, for it supplies the phosphoric acid in an easily soluble form which is immediately available to the plants. It contains large quantities of gypsum, making therefore the liming of fields unnecessary where it is used.

The nitrogenous manures are divided into three classes, according to the form in which their nitrogen prevails. They are: 1. Organic nitrogenous manures. 2. Nitrates, and 3. Ammonium compounds. In the two latter forms, especially the *nitrate*, the *nitrogen* is almost immediately available as plant-food, whereas the organic manures have to pass through a process of decomposition, before their nitrogen contents will become available to the plants.

The chief products containing organic nitrogen are of animal origin, and consist mostly of dried blood, tankage, dried meat or flesh meal, fish offal, horn or hoof meal and also hair, wool and leather clippings. All of these are of more or less value as manures, owing to the great differences in their relative percentage in nitrogen as well as their mechanical conditions. Dried blood is the most valuable one and as it readily ferments, its nitrogen is soon converted into a soluble form. Good flesh meal as well as horn and hoofmeal are also good fertilizers for some purposes, but not as quick acting and effective as dried blood. The same thing may also be said of fish-scrap (fish guano) provided it contains not too much fat. Hair, wool and leather clippings are very slow acting manure and therefore of questionable value and unsuitable for fertilizing purposes.

NITRATE OF SODA, OR CHILI SALTPETER, as it is also called, is chiefly imported from Chili and Peru, where extensive deposits are found. It contains from 15 to 16 per cent of nitrogen. Nitrate of soda is the most active of all nitrogenous manure, which is due to its highly soluble state, and is therefore often used as a top dressing where quick action is desired. No large quantities should be applied at any one time, for it is not absorbed by the soil and consequently may be easily leached and carried down into the sub-soil beyond the reach of the roots. An excessive use may produce injurious effects as it stimulates a rank growth of the foliage and retards maturity, but when judiciously applied it is a valuable stimulant.

Sulphate of ammonia is considered the most valuable of nitrogenous manures, it is almost as active as nitrate of soda, but at the same time, not quite as soluble. Its chief advantage is that it is readily absorbed and retained by the soil, especially our clay soils, without losing its good qualities. Sulphate of ammonia contains usually about 20 per cent of nitrogen. It is quite expensive, the most of it being imported from England and since annexation took place, the imported article has to carry a duty of six dollars per two thousand pounds, which does not tend to make it any cheaper. Nevertheless it is one of the principal constituents of the so-called Complete Fertilizers, and the preferred form of nitrogenous manure.

The bulk of the potash manure is manufactured by the Potash Syndicate of Strassfurt, Germany, where large deposits of Carnallit, Sylvinit, Kieserit, etc., etc., are found. These raw salts are concentrated and converted into the following potash fertilizers, viz: Sulphate of potash, containing about 50 per cent pure potash; muriate of potash, containing about 60 per cent pure potash; calcined fertilizer salts, with about 38 per cent pure potash, and Kainit with about 12 per cent pure potash. Of these only sulphate of potash and muriate of potash must be considered for these Islands. The other two are not concentrated enough to bear high freights and other charges connected with exporting, although for some purposes they are just as good manures as the former. They are therefore mostly used in Europe. Sulphate of potash seems to be the general favorite on these Islands and surely it is the best of all potash manures, for it is water-soluble and readily absorbed by the soil, where it is retained for the gradual use of the plant. Wood-ashes is also often used, but as the article generally contains only about 6 to 7 per cent of potash it is seldom imported.

Since artificial fertilizers are made out of two or more of the various materials above mentioned, it follows, that there exist wide differences in the relative percentage of phosphoric acid, nitrogen and potash, which naturally corresponds with the quantity used of each of the ingredients. As their fertilizing as well as commercial value depend upon their contents alone, it is necessary that the farmer should know exactly what he is buying.

The following combinations are mostly used, viz: Superphosphate and sulphate of Ammonia, superphosphate and sulphate of potash; superphosphate and sulphate of ammonia and sulphate of potash. These are the three best and most advantageous combinations and no doubt form the bulk of the artificial fertilizers used on these Islands. The percentage of phosphoric acid, nitrogen and potash can be made to suit the requirements of the soil. Nitrate of soda, dried blood and some of the other substances above mentioned are also often found as constituents of artificial manures. Nitrate of soda is used mostly alone as a top dressing. Fertilizers containing phosphoric acid, nitrogen and potash are called complete fertilizers.

A proper fertilizer should be of good mechanical condition and its moisture should not exceed 12 per cent. The various ingredients must be so well mixed that the different particles cannot be discerned with the eye, in fact the fertilizer must look like one homogenous article. It must not cake in the bags and when dissolved in water should contain no coarse material in the sediment.

Will it pay to use artificial fertilizers? This is indeed a well founded question, which is only answered by careful, practical experiments and trials. But under any circumstances it must be the aim of the farmer to conserve the fertility of his soils, and not only by proper tillage but also by systematic restoration of such plant-food as is taken out of the soil by the annual crops. Even the richest soil will not continue to produce good crops without the use of proper fertilizer, on the contrary it will be gradually depleted of its fertility.

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RAILWAY TRANSPORTATION IN THE TWENTIETH CENTURY—POSSIBLE NEW FORCES—ELECTRICITY AND COMPRESSED AIR.

(From the Brooklyn Eagle. By George H. Daniels, General Passenger Agent of New York Central and Hudson River Railroad.)

It is scarcely possible that the twentieth century will witness improvements in transportation that will be as great as were those of the nineteenth century. We must, however, consider the fact that two comparatively new forces are being developed, which many predict will revolutionize the present modes of transportation.

Electricity has come into general use within a few years, and its full power and the multiplicity of ways in which it may be utilized are still unknown. Each year brings some new evidence that those best informed on electrical subjects have not by any means acquired a complete knowledge of this marvelous agency.

No prophet of modern times can predict to what extent it may be applied in the twentieth century. Its development in the past fifteen years has been so wonderful and so far beyond what its most enthusiastic students believed possible at that time, that it would seem presumptuous to attempt to predict what it may do in the twentieth century. It may, however, be safe to assume that it will hardly be possible to so apply electricity as to haul great passenger trains, like the limited trains of the New York Central and the Pennsylvania, weighing a million pounds or more, between distant points, say New York and Chicago, at the rate of speed now attained by steam—a thousand miles in twenty-four hours, this speed having been exceeded by the New York Central's Exposition Flyer, that train making the time between New York and Chicago daily for 175 days of the Columbian Exposition in 1893.

The New York Central's Empire State Express, which was the record train of the nineteenth century for long-distance fast time, regularly made for several years, makes the run of 440 miles from New York to Buffalo every day in eight hours and fifteen minutes, an average speed of fifty-three and one-third miles an hour, including four stops and twenty-eight slow-downs, and for nearly one-half the distance it runs at a speed of over sixty miles an hour. This train weighs over six hundred thousand pounds.

Compressed air is another force that, having been tried in various ways, has not yet been found wanting, and its advocates claim for it the maximum of power with the minimum of cost of production. Tests of this new power in New York have proved that it is capable of moving street cars successfully, without changing the track or in any manner disturbing the street, and its adoption in many different employments has proven satisfactory. It is claimed that for short distances, like suburban travel, cars or trains of cars may be run by this new power with perfect success, and it is believed by many that it will be an important factor in the development of transportation in the twentieth century.

Improvements in the mechanism of steam locomotives will undoubtedly be made from time to time, as they have been made in the last twenty years. Many of the locomotives built ten years ago are considered out of date, so great have been the improvements in their construction in that short time. There seems to be no reason to believe that such improvements will cease with the close of the nineteenth century.

By improvements in locomotive construction, the disagreeable features of smoke and sparks from soft-coal-burning engines will be abolished early in the twentieth century; and through the adoption of automatic machinery for firing or stoking engines, the duties of firemen will be greatly changed, to the advantage of that important class of railway employees, and the future position of locomotive fireman will become more that of an assistant engineer. Automatic stokers having been successfully applied to marine and stationery engines, there seems little room for doubt that they will soon, with equal success, be applied to locomotives.

Constant improvements in the construction of cars may be expected during the twentieth century, the tendency being to build larger cars with greater carrying capacity for all kinds of traffic. Twenty years ago a car that seated from fifty to sixty passengers was a large car; today, cars seating eighty-four passengers are being constructed, and with the increase in the size of cars are coming constantly additional conveniences and luxuries, so that the standard day passenger coach of today is in many respects equal to the palace sleeping or parlor cars of twenty-five years ago.

The constantly increasing wealth of the United States and the demand upon the part of the traveling public for the very best that can be produced, and the determination of the transportation lines to meet that demand, will make the sleeping and parlor cars of the twentieth century all that can be desired in that direction.

With the growth of freight traffic in the United States, the demand for larger freight cars, as well as larger locomotives, will be met by the construction in the twentieth century of much greater capacity than those formerly in use. Twenty-five years ago the capacity of a freight car ranged from 20,000 to 30,000. Many of the great railways of America are ordering for the twentieth century cars with a capacity of 100,000 pounds or more.

The roadbed is steadily being improved, as a result of the highest technical training and the broadest engineering experience; the rails of today are from eighty to one hundred pounds to the yard of American steel, and are recognized as the best and most durable made.

Wooden bridges are being replaced by those of heavy modern steel construction, calculated to sustain the constantly increasing weight of trains; culverts are being built of heavy masonry, contributing to the durability and safety of the track. Grade crossings are rapidly disappearing, and it may be predicted that early in the twentieth century this cause of annoyance and delay will be removed.

These facts will all tend in the direction of greater speed in both freight and passenger trains, facilitating the prompt movement of products and the safe, rapid, and comfortable conveyance of travelers.

The character of passenger train service in the United States in the twentieth century will, doubtless, be improved from year to year, but it is hardly probable that any such transformation will take place as that which was seen in the United States from 1812 to 1900, unless it should be found that electricity, compressed air, a combination of chemicals, or some power of similar character is applied to the moving vehicles conveying passengers, which will not require steam produced on the vehicle to propel it, or to produce the power.

I predict that most through passenger trains will, in the twentieth century, be equipped with luxurious buffet smoking and library cars at the forward end of the train for men, and luxurious observation-library cars at the rear end of the train for women; that the ventilation of passenger trains will enlist the attention of sanitary engineers, and in this respect there will be great improvements during the twentieth century.

In all probability the more important passenger trains in the United States will be equipped with dining cars, effecting a saving in time and adding greatly to the comfort of all long-distance travel.

Early in the twentieth century, under the impetus of a liberal shipping law, American steamship lines will be established to carry our commerce in every direction.

There will be large vessels devoted wholly to freight, and undoubtedly some to particular kinds of freight; for example, cattle, grain, oil, coal, refrigerating vessels for meats and fruits; other lines will be devoted to the carriage of lumber and timber; others to structural steel, etc.—for American bridges are to go everywhere.

The construction of an ithmian canal will be one of the achievements of the early part of the twentieth century, and its effect upon transportation and everything relating thereto will be far-reaching.

The completion of the Trans-Siberian Railway early in the twentieth century will make a new way "Round the World," and open a new world to the tourist, the student, and the pioneer. Its branch lines into China will revolutionize Manchuria, and make a deep impression upon the "Middle Kingdom," as well as upon Corea.

The twentieth century will establish the commerce of the United States in an impregnable position on the Pacific Ocean.

Our vast possessions in Alaska—rich beyond calculation—will give us a hold upon the commerce of the North Pacific that no other power can ever break.

Our Hawaiian possessions will add hundreds of millions to our commerce in the twentieth century; they will also furnish under our own flag a vast region filled with scenic wonders and climatic delights for our own tourists and the growing army of round-the-world travelers, who are appreciating more and more as the years go by the unequaled luxury of American travel.

The Philippines, under the American flag, will open a new world to commerce, to travel, and to exploration, in which the United States will hold the commanding position.

It has been demonstrated that white bread inevitably follows modern, or "Western," civilization, and wheat and flour from our Pacific coast ports will be shipped in ever-increasing quantities to Japan, China, and the islands of the Pacific, making necessary large fleets of steamers to furnish the transportation for these and other American products, and to carry the return commerce, which is sure to follow. Already some of the largest steamships ever built are contracted for delivery early in the twentieth century to meet the demands of this new feature of our foreign commerce. Fast ships for carrying the mails to all these countries in and across the Pacific are under construction, and our Pacific Ocean postal facilities will be vastly improved early in the new century.

The ability to complete contracts quickly, to move materials with the greatest promptness, and to reach distant places in the shortest possible time, added to the superiority of our productions, are among the chief reasons for the employment in every country on the globe of so many of the products of the United States, so much of our skilled labor, and the adoption by other countries of so many American methods.

If it is true—and it *is* true—that trade follows the flag, then with co-operation and reciprocity between the great transportation interests of the United States and the commercial and industrial interests of our country, and with broad and liberal encouragement on the part of the Government to American shipping in the twentieth century, our commerce will be as diversified as are the products of our soil, our forests, our mines, and our mills; and our commerce will not only follow the flag, but it will carry the flag to every mart on the earth, and will flourish on every sea and river where vessels ply; for, since the almost miraculous events in Manila Bay and off Santiago, we may paraphrase the sentiment of Joaquin Miller in regard to Colorado, and say of our flag, "It floats forever in the sun."

The demand for American locomotives from all parts of the world is attributable, in the first place, to the superior quality of our machinery, and, in the second place, to the fact that the general passenger agents of the American railways have, through their advertising, made the marvelous results accomplished by our locomotives household words in every country on the globe.

They have now in Japan more than one hundred locomotives that were built in the United States. In Russia they have nearly one thousand American locomotives, and practically every railway in Great Britain has ordered locomotives from this country since the beginning of the war with Spain.

But it is not alone our locomotives that have attracted the attention of foreigners who have visited our shores; our railway equipment generally has commanded admiration, and is now receiving the highest compliment—namely, imitation by many of our sister nations.

It is beyond question that American railroads today furnish the best service in the world, at the lowest rates of fare, at the same time paying their employees very much higher wages than are paid for similar service in any other country on the globe.

In the United States the first-class passenger fares last year averaged 1.98 cent per mile, although on some large railways the average was several mills less than 2 cents per mile; in England the first-class fare is 4 cents per mile; third-class fare for vastly inferior service is 2 cents per mile, but only on certain parliamentary trains.

In Prussia, the first-class fare is 3 cents per mile; in Austria, 3.05 cents per mile; and in France, 3.36 cents per mile.

Our passenger cars excel those of foreign countries in all that goes to make up the comfort and convenience of a journey.

Our sleeping and parlor-car system is vastly superior to theirs; our baggage system is infinitely better than theirs, and arranged upon a much more liberal basis. American railroads carry 150 pounds of baggage free, while the German roads carry only fifty-five pounds free.

The lighting of our trains is superb, while the lighting of trains on most foreign lines is wretched.

I may be pardoned for citing two examples of what I mean by the unsurpassed passenger-train facilities of American railways.

A single locomotive recently hauled a passenger train of sixteen cars, nine of which were sleeping and parlor cars, from New York to Albany—a distance of 143 miles—in three hours and fifteen minutes, which is forty-four miles per hour, and is the regular schedule time of this train. The train weighed 1,832,000 pounds, and was 1,212 feet (or nearly a quarter of a mile) long.

The Empire State Express has for years been making the run from New York to Buffalo—440 miles—in eight hours and fifteen minutes, an average speed of fifty-three and one-third miles an hour, including four stops—two of them for changing engines—and twenty-eight slow-downs, on account of running through incorporated towns and cities.

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RIPE AND UNRIPE BANANAS.

Whether for shipment or home consumption the fruit is cut as soon as it is "full"—that is, when it has reached its adult form and size, but is still quite green. The plant is cut off by a single blow of a machete wielded by a powerful arm. As it falls the bunch is caught, lopped off and laid aside, while the harvester goes on to the next bunch. It is a popular supposition that bananas "ripened on the tree" are incomparably superior to those cut green. But as a matter of fact one never eats them thus ripened in Jamaica. They are said not to be so good; at all events, one finds no better fruit in texture or flavor than the best of our own markets. But every lover of this fruit knows that its quality varies extraordinarily as it is offered to us. This is due partly to the different sources from which it comes. The best that is brought to us comes from Jamaica. It is also due still more to the condition of the fruit when cut. Bananas which are perfectly full will ripen mellow and delicious; but those cut when immature, as too many are, will turn yellow, yet never truly ripen, retaining always their hard texture and unripe taste. In Jamaica, as elsewhere, the competition of buyers leads the unscrupulous ones to accept fruit of any sort, even when totally unfit, and this sort of competition makes all the more unavailing the efforts of honest buyers to raise the standard and to teach the people to withhold their fruit until it is properly developed. Americans can give moral support to these efforts by accepting only such fruit as is mature at any price. A little pains will soon enable one to distinguish good from poor fruit, though it is difficult to give a general statement of the distinctive differences. But, as a rule, it will be found that bananas that are the largest, deepest yellow and least angular are the most mature and best.—Corr. of Popular Science Monthly.

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CULTIVATION OF RUBBER TREES.

Some people may be surprised to learn that there is still a raw product that man finds just as difficult to obtain as it was a hundred years ago, and that it is harder to obtain than ever. It is the milk of a very insignificant looking tree, growing in great quantities over a large tract of territory. The tree itself is generous, liquid follows the incision; a wait of a few hours for the milk to harden and a man has the equivalent of a day's wages. This white liquid, after exposure to heat, and many species to that of the sun alone, and without any further treatment, gives thirty per cent of its bulk in pure rubber. Despite this, the world cannot obtain a tithe of the supply it needs. The simple reason for this state of affairs is that the tree, although generous itself, elects to grow in regions which for the most part are death to white men, and are removed from civilization by thousands of miles of swamp and jungle.

To alter this condition of things two sets of men are working on opposite lines. They are engaged in a sort of race for a very high stake—an unusually high stake indeed, as the pure rubber is now selling for something more than $1 a pound. One set are chemists, who have been trying their best for the last twenty-five years to find a substitute for rubber. So far there has not been an unqualified success among their attempts, and there are experts who go so far as to say that chemically it is impossible to combine for the market a substitute having the different properties of pure rubber. Be that as it may, hardly a day passes but the long-expected substitute is brought forward and the company formed to exploit the perfect substitute of the year before goes into the hands of a receiver.

The field of activity of the other set of men is very different. It is found in a few farms in Mexico and Central America, and in a few government experiment stations, notably in Jamaica and Ceylon. There are a small number of farms where something like a systematic attempt is being made to farm rubber on a large scale; some half dozen in the Isthmus to Tehauntepec and a very few more in Nicaragua, Costa Rica and the rest of Central America.

The difficulties which confront this handful of farmers are peculiar. In the first place, no one ever tried before to make rubber grow as a crop for the market. There are no data, no facts of even the simplest kind to tell these men whether their ideas are the right ones. The natives of the country take no interest in things outside their own particular business, and a man about to establish a plantation has had to start fresh, with his own ideas to guide him! and these latter cannot be said as yet to have become authoritative, for none of the farms are more than six years old, and the trees must be up that time before the question of growing them can be settled. Rubber planting, then, is not only an absolutely untried undertaking, but there has been nothing of tradition or general knowledge of the subject with which to make a start. If rubber were a delicate tree, or difficult to cultivate, the outlook would be disheartening indeed.

Second, the general conditions are against the planter. The nature of the country throws him entirely upon his own resources, and the climate is apt to be enervating, to say the least. Transportation is a great problem. Labor is scarce and not easy to handle, the native peon of Central America being a mixture of childishness and independence, and a hard drinker to boot. Although strong and active as young men, excellent axmen and better with a spade than any other laborers in the world, they become debilitated very early in life. They have no constitution and must be cared for like children. Furthermore, they look to the patron, or owner, for the settlement of every ill, spiritual or temporal. You must keep them sober, get them out of debt, make peace between them and their wives, arrange any infelicities that may occur between them and their neighbors' wives, doctor the whole family and educate the children, if you have time. For the peon is essentially a creature formed for the patriarchial system. With a chief or employer whom they know or respect the better class of peons become in many essentials ideal laborers—steady, careful, hard working, quick to catch an idea, faithful to follow it out, entirely honest; their employer's interest becomes their own. But in order to obtain this desirable state of things a farmer should be a first-rate judge of capacity and character, a fair lawyer, physician and man of business.

A third problem before the farmer of rubber is where to plant. Castillot elastica, for practical purposes the only rubber in Central America, has an extremely varied habitat. It is found at all elevations up to 2,000 feet and in a great variety of soils and locations, with a consequent variation of rainfall. So here, again, the farmer must make a choice, and one upon which his success will probably depend, with nothing to guide him in the making. As regards location, it is conceded that Castillot needs a tropical climate, a rainfall that can be depended upon, a good drainage, and an elevation of less than 1,500 feet, but these conditions have great latitude of choice.

The most important of the questions relative to the method of planting rubber is the one about which the farmers are most divided, and is probably the most vital connected with its cultivation. It is the question whether to plant in groves, in the open, or under forest shade. The advocate of the former system says that in any other part of the world, if one wants to get a particular crop, it is customary to give the tree or plant all the chance possible. One clears the ground, turns it up, and after the tree is planted keeps all weeds from encroaching upon its light and food space. Why not apply these elementary principles to rubber and plant in plowed and open land, in groves, like an apple orchard?

The advocate of the forestry system points, however, to the manner in which the tree grows naturally, and says that rubber is found thriving best under shade, in a cool, wet spot, and by "thriving" he says he means gives the most rubber. The tree will grow, it is quite true, faster in the open than in the forest, and you will get your groves of rubber trees more quickly, but the question is, will you get the milk from them? For it does seem to be a fact that rubber found in open pastures will not yield so much milk as those trees growing in the forest, where it is cooler and moister. If it could be ascertained exactly what function the milk of the tree per-formed, one would probably be able to tell how much sun and how much rain would produce the tree with the largest quantity of rubber. The milk is not a sap, but a latex, which is carried just under the outer bark, and the slightest nick from a pen knife will be followed by a thick liquid, which if caught on the finger dries at once, leaving a shred or two of pure rubber, like small elastic bands.

There are farms established by exponents of each theory. One can see in Mexico rows of young trees in open cleared land, in every respect like a coffee or orange plantation; and again in Costa Rica the farm consists of rubber trees planted in among the forest trees, only cleared where the growth is very thick, though of course the bush is kept down by cutting twice a year. Those who are following these two theories will be relieved when they get their first crop. But at present they are having rather an anxious time of it, for on the one hand it will be expensive business, not to say impossible, to plant shade among those trees in the open, and the rubber may be ruined before the shade comes up. But this course would be imperative should the advocates of the orchard theory find themselves in the wrong. On the other hand, should the forestry people be at fault it will require considerable skill for the owner of the rubber growing in the forest to cut out the trees and let in the sun without injuring the rubber. Ringing trees at the right phases of the moon, some eminent scientists to the contrary notwithstanding, will go far toward solving the problem for the grower of rubber in the forest and make his position the stronger of the two, on the whole, in that he runs the lesser risk, as it is easier to cut out the shade than to put it back.

As for the rubber planter's profits, nothing definite can be said about them as yet. A man might buy a thousand acres of good rubber land for $5,000, and he might plant it and bring it to production for $45,000 more—$50,000 in all. But now as to the returns, it is like figuring on the chicken industry; one becomes alarmed at the rate chickens, eggs and profits pile up. In the same way it is estimated that rubber will produce a handsome return every year at the end of the sixth year from planting. Anyone can work out for himself the following sum in multiplication for the profits of the eighth year: One thousand acres with 200 trees to the acre, one pound of rubber to the tree each year, sold at a net profit of 50 cents a pound.—Ag. Gazette.

INSPECTION OF BABCOCK MILK TEST BOTTLES.

W. H. Jordan and G. A. Smith.

When Dr. Babcock first announced the test which bears his name its accuracy was questioned. So many methods for determining the amount of fat in a given sample of milk had been found lacking in rapidity or in correctness that many who had a knewledge of such work were inclined to doubt the certainty of correct results in any method so simple and so rapid as the Babcock test; but as it workings have become better understood that feeling has been largely overcome and at the present time very few question its reliability if properly handled by a careful operator, who uses correctly calibrated glassware and acid of proper strength. As the use of this method has become more general as a means of apportioning the value of milk delivered at the butter and cheese factories by the individual farmer, there has come to be a quite general understanding that everything must be properly done in order to give each producer his due share. In some instances the use of the test has been discontinued on account of a lack of faith in the methods practiced by the operator. This lack of confidence has been increasing rather than diminishing, and it has been felt by those interested that some plan should be devised whereby this feeling could be overcome and a very general use of the Babcock test in butter and cheese factories promoted.

Last winter in an amendment to the agricultural law, Chapter 544, one of the provisions added was that: "Whenever manufacturers of butter and cheese purchase milk upon the basis of the amount of fat contained therein and use for ascertaining the amount of such fat what is known as the Babcock test, the bottles used in such test shall before such use be examined by the director of the New York Experiment Station at Geneva. If such bottles are found to be properly constructed and graduated so as to accurately show the amount of fat contained in milk, each of them shall be legibly and indelibly marked S. B." * * * *

The law as now worded is a step in the right direction, but other provisions should be added in order to cover the whole ground in such a way that there can be no misunderstanding of the requirements. The inspection should cover all Babcock bottles used to determine the per cent of fat in the milk, whether the milk is purchased outright or divided on a co-operative plan. The pipette and all other glassware as well as the bottles should be tested and marked. The use of mutilated or falsified glassware should be forbidden under penalty severe enough to deter the shrewd maker from breaking off the tip of the pipette or similar dishonest practices in order to show a small percentage of fat and consequent large over-run of butter. This fraudulent manipuljation of the test is one of the factors which has tended to give the impression that the system is not correct. A farmer takes his milk to the factory and it contains, by test, a certain amount of fat. On this basis he receives a given price per hundred for his milk, this price being fixed by the returns from the butter sold. When he meets his neighbor, who patronizes an adjoining factory and whose milk tests the same as his and whose butter is sold at the same price, but who gets more per hundred for the milk, he condemns the test; when the trouble is not in the method but in the way it is handled. A competent, honest man with clean, correctly graduated glassware, will give uniform results and we must have that combination to make the Babcock fat test uniformly acceptable.

Some states require the operators of the Babcock test to pass an examination to determine whether they have sufficient knowledge of its workings to make a correct test. This is a proper safeguard but it lacks in one particular, that it does not tell whether the applicant for a position is an honest man, which is quite as necessary as that he be intelligent enough to operate the machine. In order to have the work of the Babcock test perfectly satisfactory it may be necessary for the State to have careful inspection made at factories and creameries to know that the work is done in an honest, careful way.

The method followed at the Station in testing the bottles is as follows: A graduated burette, which has been carefully tested beforehand to insure its accuracy and uniformity at all points of the scale, is filled with cleaned, dried mercury. If the bottle to be tested has been used it is first thoroughly cleansed and dried; but this is omitted with new, clean bottles. The bottle is then placed under the burette and filled with mercury, first rapidly to the 0 mark, then slowly, with repeated comparison with the burette scale, to the top of the scale on the bottle. If the filling does not show any irregularity in the neck of the bottle, and if the variation is not over

1-10 of one per cent in the length of the ten per cent graduation of the bottle, it is passed as correct, as the variation in the ordinary sample of milk would be so small that it would be impossible to detect it. If the variation is 2-10 of one per cent or over, the bottle is rejected and destroyed. The law did not call for the examination of the pipettes and only a few were sent. Those that came were examined, and, as a rule, found correct.

The whole number of bottles examined was 2,259. There were rejected from that number 76 bottles. The new bottles were, as a rule, fairly correct, the largest variation being in bottles made in the early history of the test. Some bottles of that character showed a variation of nearly one per cent from the burette scale.

G. A. SMITH, Inspectors.
W. H. JORDAN,

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THE QUEENSLANDER ON DR. MAXWELL'S APPOINTMENT.

Whatever theoretical views may be held on the relation of the State to the industries of a country, the conspicuous fact is that their encouragement by the use of the public money grows in favor all over the world. Even those who cannot reconcile their judgment to the system see in it an experiment which must be thoroughly made if it is to be decisive. The history of the sugar mills which seven years ago the Queensland Government assisted with loans of public money has been chequered. Some have passed into the hands of the State creditor; some have postponed the discharge of their obligations; some are appealing to the State of further loans. But is this comparative failure the fault of the system? Is it not to be explained by initial difficulties and by the recent unprofitable sugar seasons? If the first is the sound answer, the plain duty of the State were to put an end to it as quickly as might be compatible with the real welfare of the industry. If the second is the sound answer, it may become the duty of the State to extend the term of repayment, and even to make further new loans. This last is the line taken by the Government in the amending Guarantee Bill now passed through the Assembly. Naturally such a bill meets with little opposition. For its provisions are of the kind which the Labor Party have always advocated. However anxious to put the Government in the wrong, they cannot well condemn proposals which fall into line with their own policy. Putting aside certain extreme anti-alien proposals, the real opposition came from the few on the Government side who are distrustful of the system, or think they have already proof enough of its failure.

"Of still more importance to the sugar industry of Queensland is the legislative appointment of Dr. Maxwell as expert for the colony, and the setting up at the same time of certain experimental stations. It is too late in the day to question the wisdom of such an appointment and such work. Farming by rule of thumb is at an end; and nowhere more so than in an industry which must stand in the front of economical productiveness if it is not to collapse. In the person of Dr. Maxwell we have secured an adviser who has proved his gifts. His record in the Hawaiian Islands is public property. A sugar crop which, when he went there in 1895, amounted to 153,000 tons, or three tons per acre, reached last season a total of 282,000 tons, or 4½ tons per acre, a rise of 50 per cent; and it is said that the returns for this season will not be less than 320,000 tons. It is admitted that these gratifying results are due to Dr. Maxwell's methods. We have had frequent occasions in these columns to point to the evils of faulty cultivation; they were dealt with at some length at the time of Dr. Maxwell's visit in the beginning of the year. The decreased productiveness of the soil (however you can account for it) means, if unchecked, the extinction of the industry. Dr. Maxwell comes to account for it, and to check it. Such matters as the chemistry of the soil, the growth of crops, the constitution of manures, the play of rain, sunshine, and air—some of which to the less thoughtful may seem academical enough,—these and other matters, rightly understood and applied, make the conditions of successful culture. The various experimental stations set up by the Government will enable Dr. Maxwell to apply his knowledge and experience to the natural conditions of soil and climate obtaining in different parts of Queensland."—Int. Sugar Journal.

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Experiments have been made by Professor Mosso, at Genoa, Italy, says Sugar, to test the food value of sugar in cases of exhaustion from hunger. His results confirm the theory that sugar is assimilated by the exhausted system more rapidly than bread, and showed a rapid rise in temperature within ten or fifteen minutes after a small quantity of sugar was eaten by a long-fasting animal, the effect reaching a maximum in one or two hours. Sugar restored life to dogs suffering from loss of vital heat, when albumen could not save them.

THE ASPARAGUS KING OF THE WORLD.

The Asparagus King of the World, Mr. R. Hickmott, San Francisco, Cal., is here, and constantly receiving congratulations upon the wonderful success he has achieved in a few brief years in making Bouldin Island (Cal.) asparagus famous. As one of the Eastern factors remarked: "Hickmott, you have swept the deck."

Bouldin Island (Cal.) asparagus, bearing Hickmott's name, is now sold the world around. It is exported to forty-two commercial ports, and is everywhere acknowledged the highest standard. It is freely sold in Germany, and is there regarded superior to the German asparagus. In Australia it has the lead, quite as much as in New York and other cities along the Atlantic seaboard.

The high reputation of Bouldin Island arparagus is due to a combination of causes. The soil of the island, which lies at the junction of the Sacramento and San Joaquin rivers, is alluvial and the product of centuries of deposit. It is forty feet in depth, exceedingly rich, and peculiar in its composition. Besides this, the character of the water which nourishes the soil has a great deal to do with the flavor of the asparagus. The huge beds on Bouldin Island lie on the side that is watered by the Mokulmne River, which rises in the mountains, and is a fresh-water stream, whereas the San Joaquin River, which flows on the south side and just touches one end of the island, is alkaline in its nature—so much so, that asparagus grown on land watered by that stream has a bitter taste.

Scientific cultivation is another factor, for no matter how rich Nature may be in her gifts, she will not be robbed, and demands that some return shall be made for the drain made on the soil, and hence fertilizing is part of the programme of cultivation on Bouldin Island.

Add to superior natural advantages of soil, climate, and scientific cultivation, scientific methods of preservation, and we have a combination of causes which have made Hickmott's Bouldin Island asparagus the acknowledged standard of the world. Hickmott is an enthusiast. He has asparagus on the brain, asparagus on the heart, asparagus in the pocket, and is constantly striving for still better results—if such are possible.

Just now, the aim is to secure a perfect tin can absolutely free from imperfections, either from a commercial or sanitary standpoint, and of low cost. Machines have been perfected that will turn out 40,000 such tins every day. We can now begin to understand how an output of over 2,500,000 tins of Bouldin Island asparagus can be secured.—Am. Grocer.

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TRADE OF UNITED STATES AGRICULTURAL PRODUCTS.

Washington, Jan. 27.—Frank H. Hitchcock, chief of the section of foreign markets of the agricultural department, has just issued his annual review of the trade of the United States in agricultural products. His report says:

The financial year 1900 brought to a close a century of marvelous development in the history of United States commerce. In 1800, a century ago, the total value of our merchandise imported and exported in our trade with foreign countries was considerably less than a quarter of a billion dollars. The value of the goods exchanged during the past financial year has been nearly two and a quarter billions, far exceeding all previous records. Since the opening of the century our commerce with the rest of the world has increased more than twelve-fold.

It was chiefly in the export trade that the enormous growth of the century occurred. Our domestic exports during 1900, with a recorded value of $1,370,764,571, were over forty times as large as in 1800. The total imports for 1900, on the other hand, amounting in value to $849,941,184, were less than ten times as large as in 1800.

Compared with the value of our imports for 1900, that of our domestic exports showed an excess of $520,822,387. Of the merchandise imported from foreign countries the fiscal year 1900, about 49 per cent consisted of agricultural products. These products had an aggregate value of $420,136,381, exceeding by almost $65,000,000 the record of the year before. Hides, silk and wool were the leading factors in the growth, although vegetable fibers, sugar and tobacco also showed important gains. The six items mentioned contributed nearly $60,000,000 to the increases in value.

Products of United States agriculture were marketed abroad in the fiscal year 1900 to the value of $844,616,530, forming about 62 per cent of the total domestic exports. With the single exception of 1898, the past year witnessed the largest annual export trade in farm produce on record. The value attained came within $15,000,000 of the phenomenal figures for 1898 and surpassed those for 1899 by more than $50,000,000. A considerable portion of the increase over 1899 was accounted for by the higher price of cotton. The exports of this great staple, although smaller in quantity than during the preceding year, exhibited an advance of nearly $33,000,000 in value. Aside from cotton the largest gains in value were those afforded by the exports of meat products and livestock. Tobacco, fruits and nuts, vegetable oils, oil cake and oil cake meal, dairy products and seeds also furnished examples of increase.

A comparison of the value of our agricultural exports for 1900 with that of our agricultural imports shows that the former exceeded the latter by $424,480,149. The export value was slightly more than double the amount of the import value.

Among the agricultural imports of the United States for the fiscal year 1900, the leading items named in the order of value, were sugar, hides and skins, coffee, silk, vegetable fibres, wool, fruits and nuts, tobacco, tea, wines, vegetable oils and cocoa. These twelve items comprised in value nearly 90 per cent of our entire import trade in the products of foreign agriculture during the year.

Our principal agricultural exports in 1900, as in previous years, were breadstuffs, cotton and meat products, these, with live animals, tobacco, oil cake, vegetable oils, fruits and nuts, dairy products and seeds comprising over 95 per cent of our total exports of farm products during 1900.

Our exports of breadstuffs during 1900, although far exceeding in value the average for preceding years, show a slight falling off when compared with the exceptionally heavy shipments of 1898 and 1899.

In both quantity and value our exports of Indian corn for 1900 were the largest ever reported, amounting to 209,348,284 bushels, worth $85,206,400, being greater in quantity by 35,259,190 bushels and in value by $16,228,952 than in 1899. The average annual export price per bushel for 1900 was 40.7 cents, against 39.6 cents for 1899.

The amount of American cotton supplied to foreign countries during 1900 was somewhat less than in the preceding year, the export record being 3,126,225,588 pounds, or a falling off of 561,493,434 pounds from 1899. Owing to an advance in the average yearly export price from 5.5 cents per pound to 7.8 cents per pound, however, the total value of the shipments showed an increase from $210,089,576 in 1899 to $242,988,978 in 1900.

In the exportation of meat products during the past year there was an increase of $7,082,305 over the exceptionally high figures of 1899, the total value of the consignments sent to foreign markets in 1900 reaching as high as $173,751,471, and thus surpassing all previous records.

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SEEDLING AND OTHER CANES IN BARBADOS.

We have been favored, says the International Sugar Journal, by the Imperial Department of Agriculture for the West Indies with a small pamphlet forming the summary of a paper by Professor d'Albuquerque and Mr. Bovell, lately read before the Barbados Agricultural Society, on the results of their observations during 1900, of certain seedling and other canes. It is pointed out that the results may be regarded as fairly typical for each locality, as all the canes were grown at the stations by the planters themselves, under the control of the Department, but under exactly the same conditions as other canes.

In the November 1900 number of this journal, we published some strictures by the Demerara Argosy on the results stated to have been obtained at Barbados with seedling cane B. 147. In view of the exceptional interest attaching to these experiments, in which B. 147 is included, and the difficulty of obtaining a summary such as the one before us, we have decided to reproduce the brochure in full. We think it will be clearly evident to all who will compare the tabulated results, that the former statements relative to the value of this seedling B. 147 have been fully borne out by the later experiments, and it will be seen that this cane, as compared with the White Transparent, the best of the old canes has been proved to yield 44 per cent more marketable sugar.

The following summary has been prepared in time for the planting season of 1901, in response to a wish expressed by planters.

It contains a short account of the most important of the results of the past year's experiments upon the seedling canes selected as the most promising so far raised in Barbados, two seedling canes raised in British Guiana, the well known Jamaica cane and the White Transparent cane. These have been cultivated at seven local Experiment Stations representative of the chief typical soils and climatic conditions existing in Barbados.

In the case of each variety cultivated (except White Transparent) a plot consisted of 100 holes, and at nearly every station there were two series of the varieties, so that there were two plots (duplicates) of each variety, serving to show at each station, on the field chosen, the variation to be expected with each variety from one part of the field to another. Thirty stools of each plot were actually weighed, the canes counted; the weights of the tops, and the weights and numbers of the rotten canes were also recorded. An average sample of 100 lbs. was then selected by the mechanical method proposed by one of us at the West Indian Agricultural Conference of 1899, and crushed in the mill driven by steam power at the Government Laboratory. The juice and megass were weighed, and the juice analyzed.

Three tables are given at the end of this paper, which supply: (1) the mean results obtained on five black soil estates, (2) the mean results obtained on two red soil estates, (3) the mean results obtained on all seven estates. In these tables the meanings of most of the headings are well known to planters, but a word of explanation may be needed in regard to some of them.

Saccharose, pounds per gallon. Saccharose is the same substance as sucrose. It is the pure crystal sugar of which some 89 per cent or more is contained in good muscovado sugar, and about 99 per cent in refined sugar.

Quotient of purity.—This is the amount of saccharose or pure crystal sugar contained in 100 parts of the total solids of the cane juice.

Glucose ratio.—The amount of glucose to every 100 parts of saccharose.

The last two items are important factors in determining, in a given sample of juice, whether good muscovado sugar can be made, or what proportion of marketable crystals can be recovered in the factory.

Tons of sugar per acre.—The figures in this column are calculated by a formula supplied by Mr. Douglas, of the Diamond plantation, British Guiana. They represent the amount of marketable crystals to be obtained in a first-class factory from the respective varieties.

The weight of tops given by each variety serves as some indication of the vigour of the growth of the variety, and also is a measure of its value as a fodder producer, either fresh for the immediate use of the cattle or as silage, in regard to which Mr. Thorne's experiments at Sandy Lane should prove a valuable object lesson. The percentage of juice by mill, will, with constant bracing of the mill and uniform feeding, serve as an indication of whether the cane is dry or juicy.

In selecting a variety of cane for cultivation on a large scale the chief points to be considered are: (1) Does it give a large tonnage of canes per acre? (2) Is it a good milling cane, i. e. does it pass through the mill without breaking off, and does it give a high percentage of juice? (3) Is that juice rich in sugar? (4) What is the degree of purity of the juice? Other considerations are: (5) Is the cane a healthy one, or is it subject to disease, giving a large percentage of rotten canes? (6) How long does the variety take to ripen? (7) How does it stand drought? (8) Does the seed cane (plant) germinate (spring) readily? Moreover the replies to these questions will, in a given variety, be much affected by differences in soil and climate.

The weather conditions prevailing during the growth of this crop were exceedingly trying to the more delicate varieties, which suffered severely during the long period of drought that occurred on most of the estates. This has considerably diminished the yield that would otherwise have been obtained.

List of Stations.—Showing nature of soil, height above sea level, total rainfall during growth of crop, average yield of experimental canes and average yield of sugar from experimental canes.

Black Soil Estates: Pine.—Height above sea level 100 ft., rainfall 56.23 inches, field "Garden," average yield canes 26.40 tons, sugar 3.15 tons.

Waterford.—Height above sea level 186 ft., rainfall 57.46 inches, field "Burnt," average yield canes 25.4 tons, sugar 2.95 tons.

Coverley.—Height above sea level 254 ft., rainfall ——, field "South Caminus," average yield canes 24.35 tons, sugar 2.91 tons.

Dodds.—Height above sea level 210 ft., rainfall 67.06 inches, field "Lower Chapel," average yield canes 19.56 tons, sugar 2.32 tons.

Husbands.—Height above sea level 184 ft., rainfall 64.86 inches, field "Cars," average yield canes 12.93 tons, sugar 1.37 tons.

Red Soil Estates: Blackmans.—Height above sea level 910 ft., rainfall 89.16 inches, field "Wish," average yield canes 22.90 tons, sugar 2.32 tons.

Henley.—Height above sea level 553 ft., rainfall 89 inches, field N. W. "Swamp," average yield canes 29.06 tons, sugar 3.21 tons.

List of Varieties Cultivated, giving their general field characters together with the more important agricultural, chemical, and calculated industrial results for this crop.

In regard to field characteristics, it should be borne in mind sugar canes under favorable conditions present such very different appearances from those grown during drought or on thin infertile soil, that it is a difficult matter to give what would appear to every one an accurate description.

Cane B. 147.—A delicate slow-growing cane when young, and one which does not appear to germinate freely when planted late in the season; from 11 to 12 canes to the clump. Of a bright yellow color, with long cylindrical internodes of about 4 to 8 inches long, having a slight longitudinal channel on the side the bud is attached; very rarely arrows. There is a tendency for the sheaths of the fallen leaves to remain attached to the lower half of the cane until towards the close of the year, and for this reason the sleeping roots of the nodes begin to start into life; these, however, dry on being exposed as the leaves fall. It is on the whole a hardy, vigorous, upright grower, with considerable power for resisting periods of drought. A late ripener.

Chief mean results per acre of all the stations: Canes 27.52 tons, sugar 3.1 tons, saccharose 6,291 lbs. A good milling cane, yielding a high percentage of juice fairly rich and fairly pure. With proper manipulation it should yield good muscovado sugar. It is very free from rotten canes and yields the largest weight of green tops, and is therefore first in respect to fodder supply. This cane is worthy of thorough trial by all planters.

Black Soils— Tons.

Highest yield of sugar....................3.70
Lowest yield of sugar (mean of two plots)...2.15
Mean yield of sugar (all plots).............3.01

Red Soils— Tons.

Highest yield of sugar (mean of two plots)..3.93
Lowest yield of sugar (mean of two plots)..2.69
Mean yield of sugar (all plots).............3.31

Cane B. 208—Germinates readily; from 10 to 15 canes to the clump; internodes from 3 to 5 inches long, somewhat cylindrical; color, greenish yellow; habit, upright; medium number of arrows; the dry leaves have a tendency to adhere; drought resisting.

Chief mean results per acre: Canes 22.55 tons, sugar 3.02 tons, saccharose, 5,443 lbs. Under the conditions of this year a hardy cane, yielding a comparatively small volume of rich juice of great purity, from which it is easy to make good muscovado sugar. Exceedingly free from rotten canes.

Under the conditions of growth of this crop, and taking the results of all the stations, it followed closely after B. 147 with a much purer, richer juice. Planters, however, must bear in mind it has not had the same extensive trial on an industrial scale as B. 147. In red soils, it heads the list of the plots, and shows promise of ratooning well. It should be tried especially on red soil estates.

Black Soils— Tons.

Highest yield of sugar (mean of two plots)..3.35
Lowest yield of sugar (mean of two plots) 2.28
Mean yield of sugar (all plots).............2.83

Red Soils— Tons.

Highest yield of sugar (mean of two plots)..4.23
Lowest yield of sugar (mean of two plots)...2.46
Mean yield of sugar (all plots).............3.34

Jamaica or Mont Blanc Cane.—Of such close resemblance to the White Transparent as to be practically undistinguishable, and as that cane is so well known it is not described.

Chief mean results per acre: Canes 22.11 tons, sugar 2.67 tons, saccharose 5,001 lbs. Under the conditions of this year a rather dry cane; juice fairly rich and very pure, suitable for muscovado manufacture.

Black Soils— Tons.

Highest yield of sugar (mean of two plots)..3.37
Lowest yield of sugar (mean of two plots)..1.67
Mean yield of sugar (all plots).............2.58

Red Soils— Tons.

Highest yield of sugar (mean of two plots)	3.11
Lowest yield of sugar (mean of two plots)	2.27
Mean yield of sugar (all plots)	2.83

Cane B. 347.—Germinating power fairly good, from 15 to 16 canes to the clump; internodes from 3 to 5 inches long; nearly cylindrical; color, dirty yellow blotched with red; habit, somewhat recumbent; medium number of arrows; dry leaves fall readily; drought-resisting.

Chief mean results per acre: Canes 26.71 tons, sugar 2.64 tons, saccharose 5,589 lbs. Of good milling quality, yielding a large percentage of rather poor and impure juice. We hope to see it improve in these respects under cultivation. On black soil it gave the highest tonnage of canes, and is worthy of further trial in experiment plots. It cannot at present be recommended to the muscovado planter except on a very tentative scale.

Black Soils— Tons.

Highest yield of sugar	3.91
Lowest yield of sugar (mean of two plots)	1.48
Mean yield of sugar (all plots)	2.90

Red Soils— Tons.

Highest yield of sugar (mean of two plots)	2.69
Lowest yield of sugar (mean of two plots)	1.66
Mean yield of sugar (all plots)	2.17

Cane B. 306.—Of fairly good germinating power; from 12 to 14 canes to the clump; internodes, from 3 to 4 inches long of medium size; somewhat tumid; color, bright yellow; habit, upright; few arrows; drops its dry leaves readily; fairly drought-resisting.

Chief mean results per acre: Canes 22.53 tons, sugar 2.6 tons, saccharose 5,209 lbs. Yields a medium percentage of juice of fair richness and fair quality. Requires much the same manipulation in the muscovado factory as B. 147; might be accorded a strictly limited estate trial.

Black Soils— Tons.

Highest yield of sugar (mean of two plots)	3.36
Lowest yield of sugar (mean of two plots)	1.54
Mean yield of sugar (all plots)	2.40

Red Soils— Tons.

Highest yield of sugar (mean of two plots)	3.28
Lowest yield of sugar (mean of two plots)	2.81
Mean yield of sugar(all plots)	3.04

Cane B. 156.—Germinates readily; from 10 to 18 canes to the clump; internodes from 4 to 6 inches long; slightly tumid; the buds peculiarly shaped, resembling reddish green beetles with half opened wing cases; color, yellow; habit, semi-recumbent; average number of arrows; parts readily with its dry leaves; suffers somewhat during drought.

Chief mean results per acre: Canes 24.56 tons, sugar 2.53 tons, saccharose 5,047 lbs. A dry cane yielding rather poor and rather impure juice. The results were better on red soils. It is probably capable of improvement by continued cultivation, but should be treated with caution by muscovado planters to whom, on the results of this crop, it could not be recommended for black soils. The results, however, of previous years lead us to suspend judgment.

Black Soils—	Tons.
Highest yield of sugar (mean of two plots)	2.81
Lowest yield of sugar (mean of two plots)	1.06
Mean yield of sugar (all plots)	2.08

Red Soils—	Tons.
Highest yield of sugar (mean of two plots)	3.66
Lowest yield of sugar (mean of two plots)	2.98
Mean yield of sugar (all plots)	3.32

White Transparent Cane.—About five acres of this cane on Waterford and Pine estates, and one plot (100 holes) at Dodds were reaped in each case off the same respective fields and at the same time as the selected varieties.

Chif mean yields per acre: Canes 20.49 tons, sugar 2.41 tons, saccharose 4,528 lbs. It is a rather dry cane, its juice is about the average in richness but below the average in purity. Having been recently cultivated in Barbados on a larger scale than any other cane, it may here be looked upon as the present standard for comparison.

The following is a summary of the comparative results obtained with this cane, and with B. 147 at the three estates:

ESTATE.	Cane.	Cane. Tons per acre.	Juice. Gallons per acre.	Saccharose. Pounds per acre.	Sugar Tons per acre.
Pine	White Transparent	22.48	2501	4900	2.64
	B. 147	30.32	3745	7251	3.66
Waterford	White Transparent	22.04	2625	5082	2.54
	B. 147	28.38	3868	7204	3.07
Dodds	White Transparent	16.95	1826	3592	2.05
	B. 147	31,16	3431	6544	3.70

The mean results of these three stations are:

	Saccharose. Pounds per acre.	Sugar. Tons per acre.
White Transparent	4,527	2.41
B. 147	6,999	3.47

which shows in favor of B. 147 to the extent of 44 per cent of the mean yield of the White Transparent in marketable sugar, and over 50 per cent in saccharose.

The White Transparent was only compared with the other varieties in our experiments on black soil estates; but on these soils, taking the three estates individually as well as collectively, there is a remarkable uniformity of comparative results in favor of B. 147.

Cane B. 254.—Of average germinating power, 11 to 12 canes to the clump; internodes from 3 to 5 inches long; slightly tumid; color, greenish yellow; habit, somewhat recumbent; few arrows; drops its dry leaves readily; suffers from drought when young, the end portions of the leaves becoming quite dry.

Chief mean results per acre: Cane 21.17 tons, sugar 2.40 tons, saccharose 4,840 lbs. The canes yield a favorable percentage of juice of a fair degree of richness and purity. The average tonnage was 2 per cent. less than B. 147, and the sugar yield 20 per cent less than B. 147.

Black Soils—	Tons.
Highest yield of sugar (mean of two plots)..	3.38
Lowest yield of sugar (mean of two plots)...	1.17
Mean yield of sugar (all plots)..............	2.56

Red Soils—	Tons.
Highest yield of sugar (mean of two plots)..	2.86
Lowest yield of sugar (mean of two plots)...	1.42
Mean yield of sugar (all plots)..............	2.14

Rock Hall Cane.—Germinating power somewhat under the average; from 9 to 16 canes to the clump; internodes from 4 to 6 inches long, and slightly tumid; color, yellow; habit, recumment; few arrows; the dry leaves part easily from the cane, but as the canes often trail the leaves remain attached; suffers somewhat in dry situations.

Chief means results per acre: Canes 20.53 tons, sugar 2.16 tons, saccharose, 4,465 lbs. The results were generally lower than the previous canes, but this cane is delicate and was much affected by the drought, and we think it deserves a further trial on our experiment plots.

Black Soils— Tons.

Highest yield of sugar (mean of two plots)..3.02

Lowest yield of sugar (mean of two plots)... .60

Mean yield of sugar (all plots)..............2.08

Red Soils— Tons.

Highest yield of sugar (mean of two plots)..2.82

Lowest yield of sugar (mean of two plots)...1.80

Mean yield of sugar (all plots)..............2.30

Cane D. 130.—Of fairly good germinating power; from 22 to 23 canes to the clump; internodes from 3 to 5 inches long, of small girth and constricted; color, pale yellow; habit, upright; dry leaves inclined to adhere to the stem; arrows freely; somewhat drought-resisting.

Chief mean results per acre: Canes 10.73 tons, sugar 2.37 tons, saccharose 4,596 lbs.

Very large percentage of rotten cane; apparently not adapted to the conditions prevalent in Barbados.

Black Soils— Tons.

Highest yield of sugar (mean of two plots)..2.65

Lowest yield of sugar (mean of two plots)...1.20

Mean yield of sugar (all plots)..............2.19

Red Soils— Tons.

Highest yield of sugar (mean of two plots)..3.29

Lowest yield of sugar (mean of two plots)...2.20

Mean yield of sugar (all plots)..............2.74

Cane D. 145.—Germinates readily; from 10 to 16 canes to the clump; internodes from 3 to 5 inches long, of large size and somewhat tumid; color, purple; habit, upright; arrows freely; drops its dry leaves easily; suffers badly from drought, and of very bad milling quality.

Chief mean results per acre: Canes 19.27 tons, sugar 2.02 tons, saccharose 4,207 lbs. A very large percentage of rotten canes; apparently unsuited to conditions prevalent in Barbados.

Black Soils— Tons.

Highest yield of sugar....................2.59

Lowest yield of sugar..................... .52

Mean yield of sugar.......................1.82

Red Soils— Tons.

Highest yield of sugar....................2.46

Lowest yield of sugar.....................2.27

Mean yield of sugar.......................2.37

General Conclusions.—Looking to the individual as well as general results of this year's work, there is a satisfactory degree of agreement, under a considerable variety of conditions of culture and growth. It is impossible to draw more than temporary conclusions from one year's work, but we are of opinion that B. 147, B. 208, Jamaica cane, B. 306, and B. 156 are worthy of careful estate trial, the cultivation of all but B. 147 being limited at each estate to a few acres only. Of these B. 147, B. 306, and B. 156 will require care in the muscocado boiling house, but by using an indicator such as phenolphthalein in tempering the liquor, a marketable muscovado sugar should be secured in every case. B. 147 is still the best all-round seedling variety as a plant cane in Barbados, and B. 208 gives promise of proving a good red soil plant and ratoon cane.

We are of opinion that every planter should try three or four of the varieties which at our local Experiment Stations have given the best results, looking at the black or red soil averages according to the nature of his soil. In this way, by confining his experiment to a few acres in each case, he will be able to make a choice of the variety which is best suited to the nature of his fields and to his method of cultivation.

J. P. D'ALBUQUERQUE,
Chemist-in-charge of Sugar Cane Experiments.
J. R. BOVELL,
Agricultural Superintendent of Sugar Cane Experiments.

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GERMAN vs. UNITED STATES CONSULAR SYSTEM.

In his interesting book on the commercial treaties of 1900 (which lately was published by the German bureau for the preparation of trade treaties), Dr. Vosberg-Rekow, the well-known economist, says about United States consuls:

The Americans have acted judiciously in establishing a system which is of the greatest advantage to themselves, bu costly and inconvenient to their competitors. In all countries with which it has trade relations, the United States has stationed consuls and consular agents. Every shipment of goods to a United States port must pass through the hands of these officials, and the amount, value, place of origin, market price ruling in the country of production, method of production, etc., are noted. The consuls thus dive deeply into the economic condition of their districts, and obtain information the result of which is discernible in the steadily increasing exportations of their home country.

Is this system worthy of our imitation?

It has been held that this method is practicable for the United States, because its foreign trade is concentrated in a few ports, while Germany has innumerable inland customs offices. However, if our customs bureaus receive clear instructions, they will be able to transact the business satisfactorily. Besides, I believe, this system will bring additional advantages. Our consulates, which should be greatly multiplied, would without doubt be easily maintained from the fees to be paid by the foreign shippers.

The consul, the vice-consul, and the consular agent should be professional officials, and not merchants whose interests lie with their business, as is now the case with our honorary or merchant consuls.

Our consuls should be charged to study minutely and extensively the conditions of the export trade to their country and the working methods of the manufactories and business houses engaged in these exports. To afford them the opportunity for this work, we must prescribe requisite regulations for the importations of such foreign products.

SIMON W. HANAUER,

Frankfort, October 22, 1900. Vice-Consul-General.

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ON FOREST PLANTING IN AUSTRALIA.

By Walter Gill, Conservator of Forests, South Australia.

The two main methods by which young trees are planted in South Australia are those termed respectively the "open root" system and the "bamboo tube" system.

Trees growing on the "open root" system are reared from seed sown in lines in the open ground in the nurseries. They may be one year or two years old when taken up, and on removal are generally placed in boxes containing liquid mud, or "puddle" as it is termed. The object of this is to protect the fine roots from exposure to the exhausting effect of the dry atmosphere. It is not usual to remove at a time more than can be used during, say, a day's planting, if planting is being done adjacent to the nursery, or two or three days planting if the distance be considerable. Out in the fields the trees are kept well protected with a light screen from any trying heat, and kept moist by watering as needed. It is usual to plow the ground quite 6 inches for planting on land of a tenacious nature, say, a clay loam; but sandy, easily worked land may not require plowing. The plowed land is generally well worked with the spade by the planter, and on these well worked sites holes are opened large enough to admit the young tree easily, without in any way cramping the roots or turning them up. This is a very vital point, blundering here is fatal. The planter must insert the tree and fill in the soil without cramping or turning up the roots, which should be placed so as to admit of their taking the direction toward which they naturally tend. Usually, so many men spade the ground, and so many plant trees, working in pairs.

The kind of trees usually planted "open root" in South Australia by the Forest Department are the Remarkable pine, the Cluster pine, the Aleppo pine, the Stone pine, and the Corsican pine. I usually get the pines in as early as the season will permit—June and July being the months when they are generally put in in the drier, northerly parts; but further south they can be planted at least two months later. As they are generally in early enough to secure the benefit of good spring rains, the percentage obtained is invariably over 90, often over 95.

All deciduous trees are planted on the same plan; but it is only very occasionally that such trees are planted, the land available being seldom suited for the trees of the more temperate climates on any but very limited areas.

The "bamboo tube" system is that in connection with which sections of the plant commonly called bamboo, really a reed, are cut to a length of say five inches, placed vertically as close as possible together on the floor of the nursery pit and then filled with properly prepared soil. The work of filling this into the tubes is much aided by the use of the rough beater. This is readily made from any hardwood, and, by steadily beating the tubes on the top, the soil, by concussion, settles down to the bottom of each tube. After all are properly filled, a little pinch of seed must be sown in each tube, and, with judicious watering, the seedlings appear in due course. In South Australia most of the native spring waters fail to germinate seeds; rain water, therefore, must be used. A little after the plants show the first leaf proper, they are carefully sorted over, the low plant tubes being shifted to another part of the pit, and the tubes that the empty are withdrawn for use again. The tubes may vary in diameter from one-half inch to one inch, but should not be obtained from very old bamboos, or else they will not root when planted out. As a rule, all our gums are reared for planting in the tubes, this being by far the best and most economical in rearing, planting, and carrying over long distances; while, at the same time, proving safer than any other system, as far as root exposure is concerned. The tube plants are taken to the field in planting boxes, simply made, so that they rest on a short foot, which keeps them tilted up. This has the effect of keeping the moist liquid mud at one end, so that it remains around the tubes, the bottoms of which are thus absolutely shut off from the dry air, preventing root exhaustion entirely. The men work in pairs. The spaders work the ground well, then drive down the spade, and make a cut by working it backward and forward, leaving the cut open. The planter then places the tube tree therein, but must be exceedingly careful to see the tube bedded right to the bottom. If he did that, when the tree started to throw out fresh roots, tender and white at the base of the tube, they would come out into the empty space, and perish. The tree might try others for a short time, but ultimately it would perish. It is always well to place the tree as far under the soil as possible, because the tube is more certain to decay when well in ground, as the damp can act on it better than when it shows on the surface. Not only so, but the lower you can get to the bottom of the tube the cooler is the soil, and the less can the heat affect the general vitality of the little plant. Anchor roots also often form, and help to steady the tree from wind action. A little after planting, the trees are generally lightly hoed, or spaded, or forked round according to the requirements of the soil, and this prevents the ground from caking, and hinders the capillary action of the sun. Precipitated moisture, however light, is the better retained, and the ultimate growth of the trees better secured in this way. The system of rearing trees in pots can only be followed where limited areas are acted on and special results are desired, as the cost is excessive in rearing, transit, and planting, compared with the two methods previously indicated.—N. S. W. Ag. Gazette.

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To those who are familiar with the use of modern fertilizers, or who are at times compelled to mix the ingredients, for use in remote localities, the article on this subject, in this number of the Planter, written by an experienced chemist, will prove valuable. It will serve to throw light on some points which planters are at times puzzled to account for. Imported fertilizers do not always produce the desired results, and the cause, in some instances may be found to be stated in our correspondent's article.

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A CALIFORNIA ACRE—WHAT IT HAS PRODUCED—THE VALUE OF ITS PRODUCTS.

S. S. Boynton of Oroville gives the following interesting statistics concerning the productiveness of California soil:

"Such exaggerated tales are related of California's soil and climate, tales bordering upon the strange, unreal and marvelous, that Eastern readers discredit the most trustworthy facts and regard the California writer as a veritable Munchausen, ever ready to pour into the ears of the credulous the most astounding and fabulous stories. Bearing this in mind, it is with some hesitation that I give to readers the following reliable and well-attested facts, showing what an acre of California soil, under the most favorable climatic conditions, is capable of yielding:

"An acre of Royal apricots in Yolo returned $240. An acre of Ben Davis apples in Fresno realized $300. An acre of potatoes in Butte yielded 300 sacks, that sold for 75 cents each, or $225. An acre of blackberries in Glenn, selling at 3 cents a pound brought $250. An acre of almonds in Solano gave $187, the grower being A. T. Hatch. An acre of Muscatel grapes in Yolo realized $302.75. An acre of prunes near Visalia, on the land of Jacob & Brother, yielded 52,000 pounds, which sold for 1¾ cents per pound, or $910. An acre on Bear river, in Yuba, grew one and one-third tons of hops, which sold for 15 cents a pound, or over $400. An acre of blackberries in Los Angeles gave fruit to the amount of $350. An acre of tomatoes in Butte returned $600. An acre of nectarines in Fresno brought $250. An acre of English walnuts in Santa Barbara yielded $338. An acre of strawberries in Los Angeles yielded $800. An acre of potatoes in Santa Cruz gave $251. An acre of olives, grown by Elwood Cooper, in Santa Barbara, returned $1,000. An acre of apples in Monterey gave a profit of $1,200. An acre of peaches in Coloma yielded Barney McBride 1,000 boxes, the fruit selling at 8c. a pound. An acre of almonds in Glenn gave $400, the fruit selling at 8c. a pound.

An acre of Tokay grapes in Sacramento gave R. D. Stephens $320. An acre of currants in Napa gave $350. An acre of lemons in Los Angeles realized $450. An acre of mixed blackberries, strawberries and raspberries in Sutter gave G. Bremer $1,500 An acre of English walnuts in Orange returned $540. An acre of apricots in San Diego yielded $416. An acre of almonds in Yolo gave $283.50. An acre of mixed fruit at Coloma yielded $300. An acre of sugar-beets in Santa Cruz gave twenty-six tons which sold for $78. An acre of alfalfa at Redlands yielded fourteen tons, which sold for $112. An acre of Bartlett pears in Sutter gave the Sutter Orange Company $1,144. An acre of vegetables in Colusa, grown by Chinese, yielded $1,000. An acre of pampas plumes in Los Angeles returned, when the plants were four years old, $400. An acre of Ben Davis apples in Butte, grown by M. V. Roe at Nimshew, yielded $967.50.

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WIDE TIRES.

"Many tests have been made to establish the claims in favor of wide tires as against the narrow ones, and a few of the results are stated in Bulletin No. 12 of the United States Department of Agriculture by General Roy Stone. In Utah, at the experiment station, it was shown that a given load on a one and one-half inch tire pulled 40 per cent heavier than when on an inch tire, the test being made at the State University. An ordinary wagon with a new 3-inch tire was loaded with two long tons, or 4,480 pounds, and the draught measured by a dynomometer. On an ordinary earth road, in good condition and hard, the draught was 254 pounds. On a grass field it was 468 pounds. On a newly plowed field it was 771 pounds. As 150 pounds is the draught of an ordinary horse of 1,000 pounds, two horses could draw this load with ease on an ordinary road, and a ton and one-half on a grass sod, while with a narrow tire one-half as much, or a single ton, is a full load for a double team. Besides this the broad tires roll and level a road, so that the more they are used the better the road becomes, while narrow tires cut ruts, if it is at all soft.

Professor Sanborn, of the Missouri Agricultural College, tried the same experiment with wagons having tires of different widths, using a Baldwin dynomometer. The weight of the load drawn was 3,665 pounds each. The tires were one and one-half inches and three inches, respectively. The tests made were made on blue grass sod partially moist. The draught of the wide tires averaged for level ground 310 pounds. For the narrow tires the draught was 439 pounds, or 41.6 per cent more than the wide tire. Assuming the wagon to weigh 1,000 pounds, then on the broad tire 3,248 pounds would be drawn as easily as 2,000 pounds on the narrow tires. Again, the broad wheels in the trial did not injure the turf, while the narrow wheels cut through it.

"In France every freight and market wagon is a roadmaker. The tires are from three to ten inches in width, usually from four to six. With the new four-wheeled vehicles used the tires are rarely less than six inches in width, and the rear axle is about fourteen inches longer than the fore axle, so that the rear or hind wheels run about one inch outside the level rolled by the front wheels.

"In Germany the rule prescribes that all the wagons drawing heavy loads such as coal, brick, earth, stone, etc., must have tires at least four inches wide.

"By carefully noting these regulations, one will see that in the European countries they have long ago discarded the narrow tires, much to the advantage of their roads and the saving of their horses and vehicle.

"It will be seen, therefore, that the wide tires are not only lighter in their draught than narrow ones under nearly all conditions, but they cut up the road but very little; in fact, when six inches wide they tend to make the road continually better."—N. Y. Tribune.

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WIRELESS TELEGRAPHY BETWEEN BELGIUM AND ENGLAND.

There has been recently established at La Panne, Belgium, a station for the exchange of wireless telegraphic messages between Belgium and England. The receiving apparatus to be used on the English coast was taken across a few days ago from Ostende on board the Dover-Ostende mail boat Princess Clementine, which is also fitted up with temporary apparatus to be used in the experimental trials. La Panne has been selected on account of its being the point on the Belgian littoral nearest the English coast. The mast of the Marconi station at La Panne is 130 feet high. To the foremast of the steamship Princess Clementine is affixed an additional mast, which increases its original height about 60 feet. From this extremity, the telegraphic waves will be projected toward each coast. A special room has been fitted up on board the steamer for the instruments, and from this room the cable will be carried to the top of the extended mast. It is confidently expected to obtain communication between ship and shore for at least 30 miles, which is about halfway across. With stations at La Panne and Dover, those on board the vessels would be able to keep in touch with the land during the entire crossing.

On November 3, experiments began about 5 p. m. Telegrams were exchanged between the boat, then moored at the Ostende wharf, and the station at La Panne. Later in the evening several of the Marconi men went on board the vessel and communicated with the land station throughout the crossing, except when they arrived in English waters. Communication was then discontinued, as the Belgian Government has not yet received from the English Government authority to telegraph from Dover by this new system. This week—probably Wednesday or Friday—the official trial under the supervision of the Government delegates will be made.

The experiments showed that replies arrived with the same regularity and celerity as ordinary telegrams. When about 40 miles from Ostende, the captain of the vessel was able to telegraph to the stationmaster at Ostende the probable hour of his arrival. Various telegrams were sent from the vessel to Ostende, Brussels, Dover, London, and to the officers of the chief bureau and branch offices of the Marconi Company. The reception of each message was acknowledged promptly, the first and last letters being given in each instance.

GEO. W. ROOSEVELT,

Brussels, November 6, 1900. Consul.

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Every reader of this number of the Planter will be interested in the article on Railway Transportation, written by one of the most prominent railway men in the United States. To those who are not familiar with the rapid progress and changes now going on in America, it will prove a surprise. He makes some good predictions, but the progress of the past few years, warrant the belief that every word he says will come to pass. It is a great compliment to America that she has forged to the front as the rapid-transit pioneer, supplied with all the necessary accompaniments necessary to secure the safest and most rapid conveyance, with the greatest ease and comfort.

HONOLULU STOCK AND BOND EXCHANGE, APRIL 23, 1901.

STOCK	Capital Authorized	Shares Issued	Capital Paid up	Par Value	Last Sale
MERCANTILE					
C. Brewer & Co.	$ 1,000,000	10,000	$ 1,000,000	$ 100	415
N. S. Sachs' Dry G'ds Co. L'd.	60,000	600	....	100	100
L. B. Kerr & Co, Ltd.......	200,000	4,000	....	50	.....
SUGAR					
Ewa Plantation Company ...	5,000,000	250,000	5,000,000	20	28
Hamoa Plantation Company	175,000	1,750	175,000	100	.....
Hawaiian Agricultural Co...	1,000,000	10,000	1,000,000	100	310
Hawaiian Com'l & Sugar Co.	10,000,000	100,000	2,312,750	100	80
Hawaiian Sugar Company...	2,000,000	100,000	2,000,000	20	41
Honomu Sugar Company...	750,000	7,500	750,000	100	172½
Honokaa Sugar Company ...	2,000,000	100,000	2,000,000	20	33¼
Haiku Sugar Company......	500,000	5,000	500,000	100	.....
Kahuku Plantation Company	500,000	25,000	500,000	20	25½
Kihei Plant. Co. Ltd, Assess.	1,500,000	30,000	1,425,000	50	11
Kihei Plant. Co. Ltd, Pd. up	1,000,000	20,000	1,000,000	50	12½
Kipahulu Sugar Company...	160,000	1,600	160,000	100	.....
Koloa Sugar Company......	300,000	3,000	300,000	100	.....
Kona Sugar Company.......	500,000	5,000	500,000	100	.....
McBryde Sug. Co. L'd. Assess	1,850,000	....	1,036,000	20	7½
McBryde Sug. Co. Ltd. Pd up	1,650,000	....	1,650,000	20	12
Nahiku Sug. Co. Ltd. Assess.	675,000	33 750	....	20	.....
Nahiku Sug. Co. Ltd. Pd. up	75,000	3,750	....	20	.....
Oahu Sugar Co.............	3,600,000	36,000	3,600,000	100	156
Onomea Sugar Co	1,000,000	50,000	1,000,000	20	30
Ookala Sugar Plantation Co.	500,000	25,000	500,000	20	18½
Olaa Sugar Co. Ltd., Assess.	2,500,000	125,000	865,000	20	4⅝
Olaa Sugar Co. Ltd., Paid up	2,500,000	125,000	2,500,000	20	15¼
Olowalu Company	150,000	1,500	150,000	100	.....
Paauhau Sug. Plantation Co.	5,000,000	100,000	5,000,000	50	.....
Pacific Sugar Mill	500,000	5,000	500,000	100	.....
Paia Plantation Company ...	750,000	7,500	750,000	100	.....
Pepeekeo Sugar Company...	750,000	7,500	750,000	100	.....
Pioneer Mill Company......	2,250,000	22,500	2,250,000	100	117½
Waialua Agricultural Co....	4,500,000	45,000	4,500,000	100	117½
Wailuku Sugar Company....	700,000	7,000	700,000	100	370
Waimanalo Sugar Company	250,000	250,000	250,000	100	150
Waimea Mill Company......	125,000	125,000	125,000	100	97½
MISCELLANEOUS					
Wilder Steamship Company	500,000	5,000	500,000	100	100
Inter-Island Steam Nav. Co.	600,000	6,000	600,000	100	100
Hawaiian Electric Company.	300,000	3,000	300,000	100	110
Honolulu R. T. & Land Co...	250,000	2,500	250,000	100	.....
Honolulu Steam Laundry...	25,000	250	25,000	100	.....
Mutual Telephone Company	150,000	13,900	139,000	10	9⅝
Oahu Railway & Land Co...	4,000,000	40,000	4,000,000	100	105
People's Ice & Refrig. Co...	150,000	1,500	150,000	100	85
BANKS					
First National Bank........	500,000	5,000	500,000	100	.....
First Am. Sav. B. & Trust Co.	250,000	2,500	250,000	100	.....
BONDS	Amt. of Issue				
Hawaiian Govt. 6 per cent...	2,924,200	Dec. 31, 1900	....	.....	.....
Hawaiian Govt. 5 per cent...	1,251,200		....	.....	100
Haw'n G. Post. Sav. 4½ per ct	11,000		....	.....	97
Hilo Railroad Co., 6 per cent	450,000	....	....	.....	.....
Hono. R. T. & L. Co, 6 p. c.	300,000	....	....	.....	.....
Ewa Plantation 6 per cent...	500,000	....	....	.....	101
Oahu Railway & L'd Co 6 p. c.	2,000,000	....	....	.....	104
Oahu Plantation 6 per cent..	750,000	....	....	.....	.....
Olaa Plantation 6 per cent ..	1,250 000	....	....	.....	.....